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# **ADDENDUM to ITG Line 2.0/i2004 NTP (Standard 1.00)**

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**Meridian Internet Telephony Gateway (ITG) Line 2.0/i2004  
Internet Telephone (553-3001-204), Standard 1.0,  
October 2000.**

*Read the following information before you read the Nortel Networks  
technical publication (NTP).*

*For complete information on Meridian Internet Telephony Gateway  
(ITG) Line 2.0/i2004 Internet Telephone refer to the Description,  
Installation and Administration Guide (553-3001-204).*

## **Refer to "Meridian 1 capacity engineering guidelines"**

Add the following paragraph:

The average number of Busy Hour Call Attempts should not exceed an average of 1200 BHCA per hour.

### **Capacity Engineering Considerations**

Add the following paragraph:

There are restrictions on the number of i2004 Internet Telephones that may be installed on certain system types. These limits result from the time required to re-register all of the i2004 Internet Telephones after the Meridian 1 initializes. Please refer to the Meridian Internet Telephony Gateway (ITG) Line 2.0 and i2004 Internet Telephone Product Bulletin for or the Read Me First document for more information.

## **Refer to "Configuration of the DHCP server"**

### **Page 91.**

Add the following note to the Overview section:

*Note 3:* For Setup and Configuration of various DHCP servers, refer to Appendix G.

## **Refer to "ITG Line 2.0 card administration"**

### **Procedure 34 on page 184.**

The last sentence should read:

Refer to "Installation and configuration of ITG Line 2.0 node" on page 105 and Procedure 9 on page 123, to add a card to a node.

### **Page 192.**

The last sentence should read:

To download this file from the ITG Line 2.0 card from the MAT/OTM PC perform Procedure 42 on page 193.

### **Procedure 42 on page 193.**

Delete step 1.

### **Table 33 on page 195.**

Modify the shell commands: currOMFilePut; prevOMFilePut; LogFilePut.  
Delete the shell command: prevLogFilePut.

### **Page 196.**

Add the following paragraphs:

#### **Configure TLAN parameters**

Auto-negotiate mode may be disabled if the ports on some data network hubs and routers are manually configured by the user. For example configuring a port for 100 baseT full duplex may disable auto-negotiation on the signaling link.

The ITG Card and i2004 phone default to half duplex mode when no auto-negotiation signaling occurs (per the standard). The subtle yet critical result of this is the ITG card/ i2004 phone operates in half duplex mode while the hub is in full duplex mode. The two will communicate and may even

appear normal, but random packet loss will occur which may affect the correct operation and voice quality.

This leads to the following recommendation:

**IMPORTANT**  
Set ports for auto-negotiation, auto-sense.

Configure the speed and duplex of the TLAN connection using the following commands:

- **tLanSpeedSet speed.** This command sets the speed of the TLAN interface. By default, the interface auto-negotiates to the highest speed supported by the hub or switch. If the switch is 10/100BT, the interface negotiates to 100BT. Use this command to debug ethernet speed related problems by forcing the interface to 10BT operation immediately. The duplex mode setting is saved in NVRAM and read at startup. The parameter speed is set to the following:
  - 10 - enables 10MB only operation
  - 10100 - enables auto-negotiation
- **tLanDuplexSet duplexMode.** This command immediately sets the duplex mode of the TLAN interface while operating in 10BT mode. the duplex mode is saved in NVRAM and read at startup. The parameter duplexMode is set to the following:
  - 0 - enables full duplex mode
  - 1 - enables half duplex mode

### **Configure voice activity detection**

Configure and view Voice Activity Detection using the following commands:

- **itgSetVAD 0|1.** This command configures voice activity detection to off (0) or on (1). This setting overrides the codec configuration. The setting is not permanently stored therefore the setting is lost if the card is rebooted.

- **itgVADShow**. This command displays the current VAD configuration and DSP setting.

### **Packet loss monitor**

Monitor audio packet loss using the following commands:

- **vgwPLLog 0|1|2**. This command enables the packet loss monitor. A value of zero disables packet loss logging. A value of one logs a message if packet loss during the course of the call exceeds the threshold set with the **itgPLThreshold** command. Packet loss is measured in the receive direction and the two halves of a call are monitored and logged independently.
- **itgPLThreshold xxx**. This command sets the packet loss logging and alarm threshold. xxx is a number between 1 and 1000, and represents the threshold in 0.1% increments. Packet loss which exceeds the threshold, generates an SNMP trap and writes a message to the log file if logging is enabled. The default value is 10 (1%).

## **Refer to "ITG Line 2.0 card maintenance"**

**Table 40 on page 218. Add the following commands after the **isetShow** command:**

- **isetShowByTN**. Show general information about all registered sets, sorted by TN.
- **isetShowByIP**. Show general information about all registered sets, sorted by IP address.
- **pbxLinkShow**. Display information about the link to the M1 CPU, including the configuration and link status.

## **Refer to page 285.**

Add Appendix G, "Setup and Configuration of DHCP Servers".

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# Appendix G: Setup and Configuration of DHCP Servers

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## Installing a WinNT 4 server

To set-up the WinNT 4 server, follow the instructions provided in the installation booklet. After completion, install Service Pack 3 and make sure to include the DHCP Manager.

### IMPORTANT

If you are installing a WinNT 4 server with **Service Pack 4 or later**, follow the installation instructions included with your server hardware.

## Configuring a WinNT 4 with DHCP

Configure a WinNT 4 server with DHCP services using the GUI provided. The DHCP manager comes equipped with a Help menu and the administrator

### Procedure 1

#### Launching the DHCP Manager

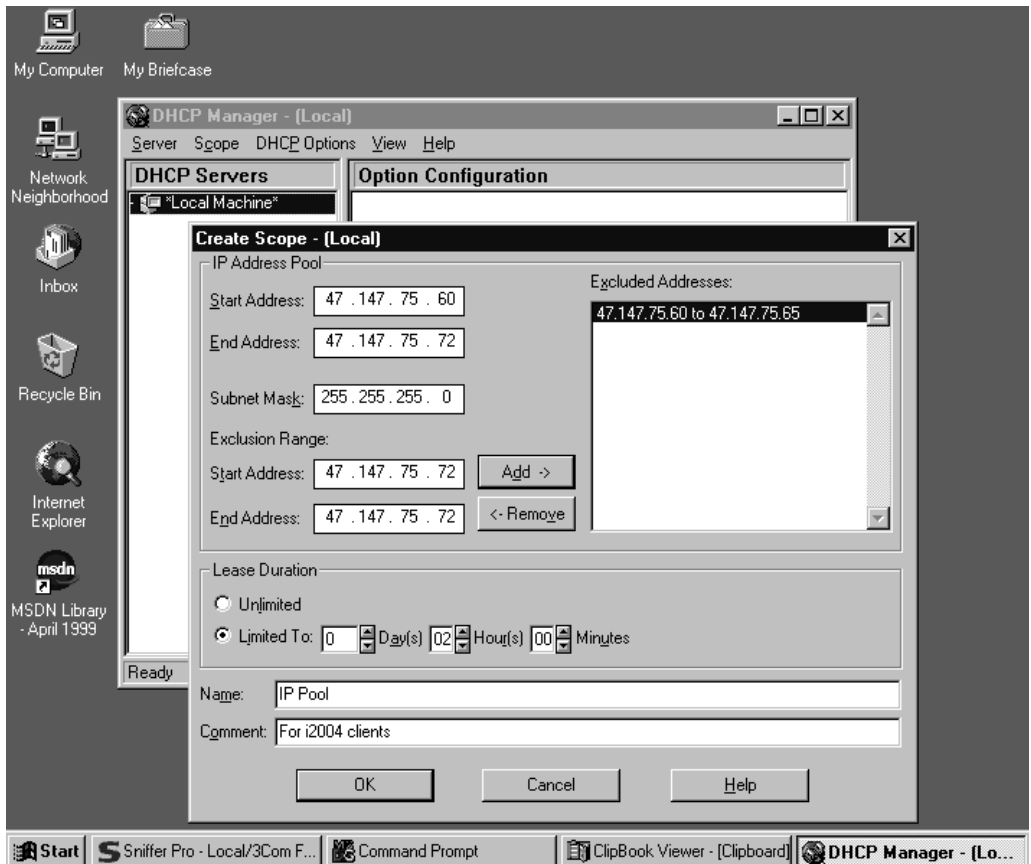
- 1 Click on the Windows **Start menu button** as shown in Figure 1 on page 6.
- 2 Select **Programs**.
- 3 Select **Administrative tools (common)**.  
The **DHCP Manager** window opens.
- 4 Double click on Local Machines on the left panel.  
The **Create Scope (Local)** window opens.
- 5 Create and then fill in the information (See Figure 2 on page 7).
- 6 Click OK when finished.
- 7 In the DHCP Manager (Local) window, highlight the scope that will serve the i2004 clients.
- 8 From the **DHCP Options** menu, select 'Default **Values**'.

- 9 Click on the **"New"** button. (See Figure 3 on page 8).
- 10 Fill in the information and click OK when finished.

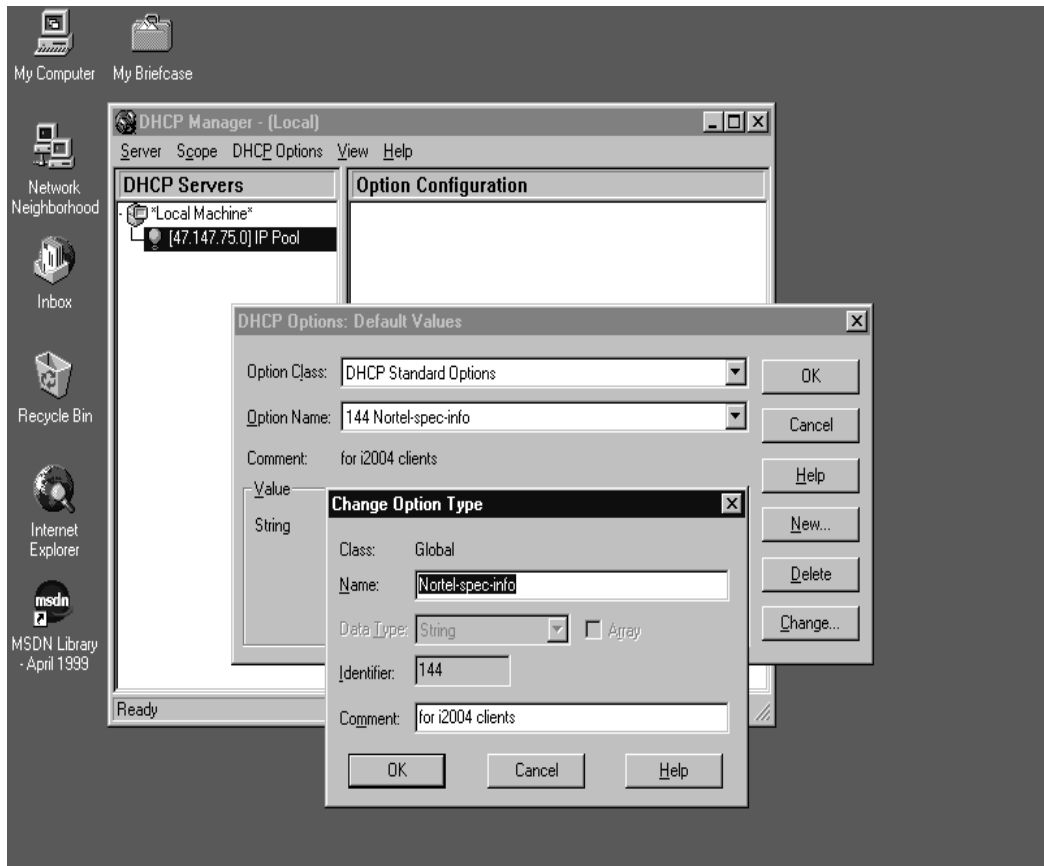
**Figure 1**  
**Windows NT server screen**



**Figure 2**  
**Defining a new scope**



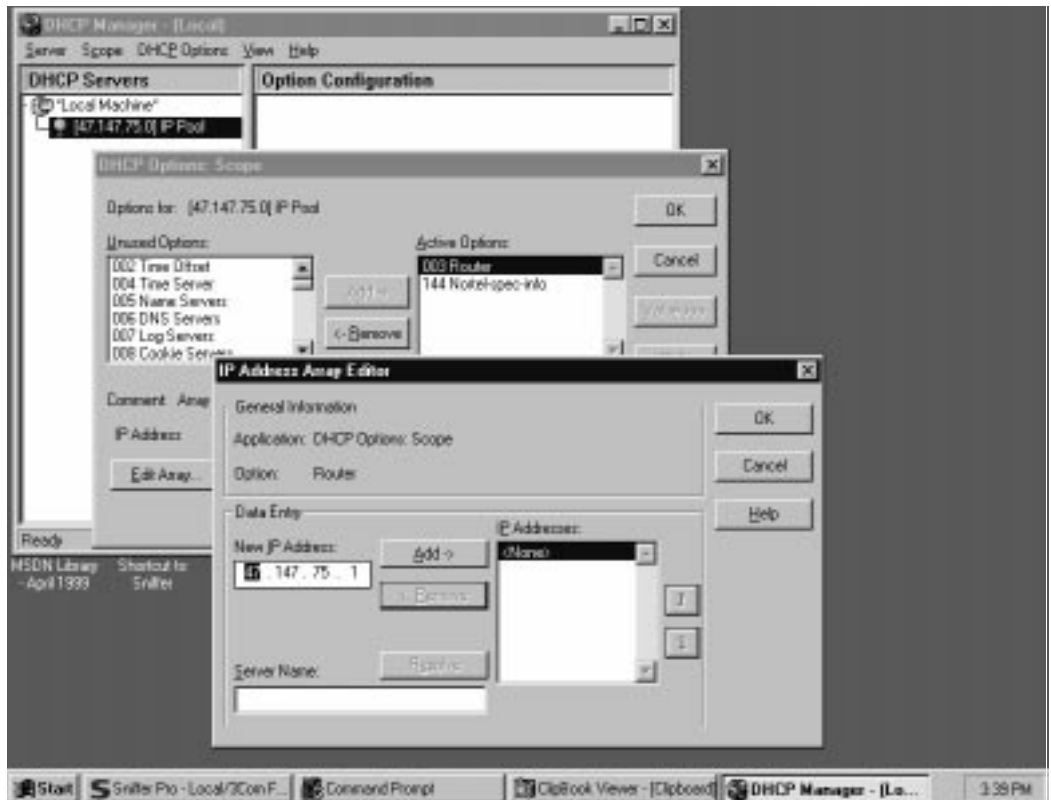
**Figure 3**  
**Defining the Nortel-specific option**



- 11 From the DHCP Manager window, highlight the scope to which you want to add DHCP options.
- 12 From the **DHCP Options** menu, select **Scope**.  
The DHCP Options Scope window opens.
- 13 Chose standard DHCP options from the left panel and add them to the right panel, as shown in Figure 4 on page page 9.
- 14 Edit the default value using the Edit Array Button



**Figure 4**  
**Adding standard DHCP options to scope**



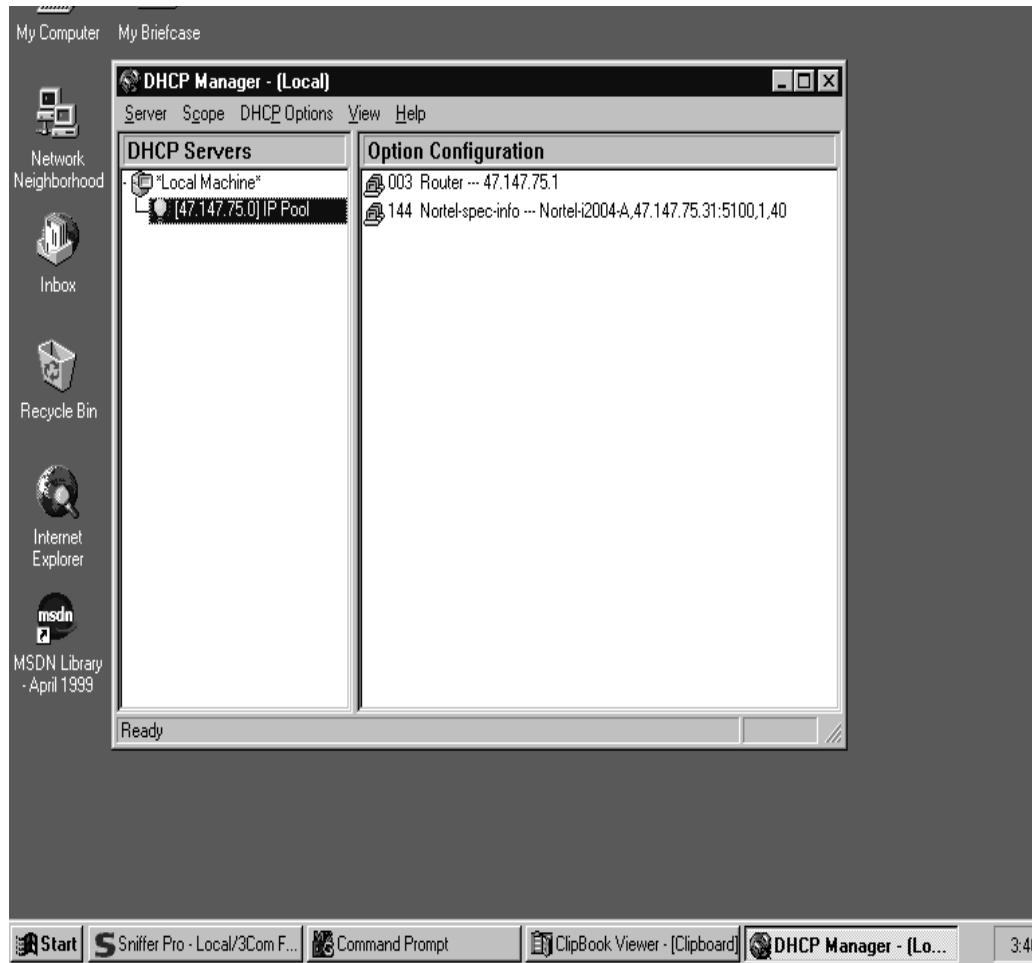
- 15 From the DHCP Manager (Local) window, highlight the scope that needs to be activated.
- 16 From the **DHCP Options** menu, select **Scope**.  
The DHCP Options Scope window opens.

- 17 Click on the **“Activate”** button.

The light bulb next to the scope should turn yellow as in Figure 5 on page 10.

----- *End of Procedure* -----

**Figure 5**  
**Activating the scope**



## Installing ISC's DHCP Server

To set-up ISC's DHCP server, read the README file and follow the instructions on how to compile, make and build the server. Once set-up is complete, configure the server by following the description in the next section.

### CAUTION

Although, WinNT 4 also has the Vendor Encapsulation Option (option code 43), it should not be used to encode the ITG card information needed by the i2004. This is because WinNT 4 only allows 16 bytes of data to be encapsulated which is not enough to encode all the information needed.

WinNT 4's DHCP server will transmit any user-defined option associated within a scope if the client requests it. It does not have the ability to distinguish among different types of client, hence cannot make decisions based on this information. This makes it impossible to create client specific IP address pool/scope.

## Configuring ISC's DHCP Server

To configure ISC's DHCP server, a text based configuration process is used. Configuration is done by adding definitions and declarations in the `dhcpd.conf` file located at `/etc/`. Various man files are provided on how to configure the server, the lease system, using options and conditions, and running the server. Obtain the `dhcpd.conf.man5` file in the server directory and read it carefully. It provides explanations on relevant topics as well as location of other man files to read for additional information.

### Configuring ISC's DHCP to Work with i2004

Use Procedure 2 on page 12, and Example 1 on page 13 to configure ISC's DHCP server to work with the i2004. Also a copy of the configuration file used for this project, is provided at the end of this section.

## Procedure 2

### Configuring ISC's DHCP server

- 1 Configure the server to identify a client correctly as the i2004 EtherSet. This is done using a **match** statement with a conditional **if** enclosed inside a **class** declaration, as follows:

```
class "i2004-clients" {  
    match if option vendor-class-identifier =  
    4e:6f:72:74:65:6c:2d:69:32:30:30:34:2d:41:00;}
```

The Hex string represents the text string "Nortel-i2004-A". If the vendor-class-identifier obtained from the client's DHCPDISCOVER message match this Hex-encoded string, then the server adds this client to the "i2004-clients" class. Once a client is classified as a member of a class it must follow the rules of the class.

- 2 Declare a pool of IP addresses exclusively for the members of the "i2004-clients" class. The pool declaration is used to group a range of IP addresses together with options and parameters that apply only to the pool.
- 3 Restrict access to the pool. Use the **allow** or **deny** statement to include or exclude the members of a particular class. For example, the follow configuration code allows only members of "i2004-clients" to use this IP address pool:

```
pool{  
    allow members of "i2004-clients";  
    range 47.147.75.60 47.147.75.65;  
    option routers 47.147.75.1;  
  
    # Nortel Networks special string  
    option vendor-encapsulated-options 80:3d:4e:6f:72:...;}
```

**Note:** If a client is not a member of this class, it will not be assigned an IP address from this pool even if there were no other available IP addresses.

- 4 The DHCPPOFFER from the ISC server must include the ITG card information if the client is an i2004 set. There are two methods to encode the necessary information for the i2004 client:
- a. Use the **vendor-encapsulated-options** option (as in the previous example) to encode the information as a sub option.
  - b. Define a **Site Specific option** to carry the necessary information. To define a site specific option:
    - give a declaration in the form of name of the option, the option code and the type of data it carries outside any pool or network declarations. For example:  
  
option nortel-specific-info code 144 = string;
    - replace the vendor-encapsulated option inside the pool statement with the definition,  
  
option nortel-specific-info = "Nortel ...";

————— *End of Procedure* —————

## Configuration file

There is a particular format for encoding the ITG card information. In addition to the configuration statements provided, other network and subnet declarations must also be included in the configuration file. As mentioned in the beginning of this section, read the man files and use the following example as a guideline:

### Example1:

**# File name: dhcpd.conf**

**# Location: /etc/**

**# Description: Configuration file for ISC dhcpd server**

**# Author: Cecilia Mok**

**# Date: September 24, 1999**

# Global option definitions common for all supported networks...

```
default-lease-time 300;

max-lease-time 7200;

option subnet-mask 255.255.255.0;

option broadcast-address 255.255.255.255;


# Defining nortel-specific option for i2004 client

option my-vendor-specific-info code 144 = string;


# Declaring a class for i2004 clients.

# Add new clients to the class if their Class Identifier match the special i2004
ID string.

class "i2004-clients"

{

    match if option vendor-class-identifier =
4e:6f:72:74:65:6c:2d:69:32:30:30:34:2d:41:00;

}


# Declaring another class for PC clients

class "pc-clients"

{}


# Declaring a shared network
```

```
# This is to accommodate two different subnets on the same  
# physical network; see dhcpd.conf.man5 for more details
```

```
shared-network "myNetwork"
```

```
{  
  
    # Declaring subnet for current server  
  
    subnet 47.147.77.0 netmask 255.255.255.0  
  
    {}
```

```
# Declaring subnet for DHCP clients
```

```
    subnet 47.147.75.0 netmask 255.255.255.0
```

```
    {  
  
        # Pool addresses for i2004 clients
```

```
        pool
```

```
        {  
  
            allow members of "i2004-clients";  
            range 47.147.75.60 47.147.75.65;
```

```
  
            option routers 47.147.75.1;
```

```
  
        # Nortel Networks special string
```

```
        option nortel-specific-info = "Nortel...";
```

```
}  
  
    default-lease-time 180;  
  
    max-lease-time 300;  
  
}  
  
}
```

Finally, before starting the server, create a blank `dhcpd.leases` file in the `/etc` directory: the same location as the `dhcpd.conf` file. Then to start the server, go to `/var/usr/sbin/` and type:

```
./dhcpd
```

To run in debug mode, type:

```
./dhcpd -d -f
```

————— *End of Example* —————

## Installing and configuring a Solaris 2 server

### Installing a Solaris 2 Server

To setup the Solaris 2 server consult the accompanying manual and online documentation.

### Configuring a Solaris 2 server

Use Procedure 3 on page 16 to configure Solaris 2 with DHCP.

#### **Procedure 3**

#### **Configuring a Solaris 2 server**

1 Read the man pages listed below:

- `dhcpconfig`
- `dhcptab`
- `in.dhcpd`

**Note:** There are directions at the end of each page referring to other sources that may be helpful.



- 2 Collect information about the network such as subnet mask, router/gateway and DNS server IP addresses as specified. Make sure this information is current.
- 3 Logon as **root** and invoke the interface by typing `dhcpconfig` at the prompt. A list of questions will be presented and the administrator must supply answers, which are then used to configure the DHCP server.  
**Note:** Solaris 2 uses a text-based interface for configuring DHCP services.

————— *End of Procedure* —————

#### **Procedure 4** **Configuring Solaris 2 to Work with I2004**

- 1 Create a symbol definition for defining a Site Specific option by typing the following in the `dhcptab` configuration table located at `/etc/default/dhcp`:  
  
NI2004 s Site,128,ASCII,1,0  
  
Or
- 2 Use the `dhtadm` configuration table management utility by typing the following command at the prompt:  
  
dhtadm -A -s NI2004 -d 'Site,128,ASCII,1,0'  
  
where,  
NI2004: symbol name  
s: identify definition as symbol  
Site: site specific option  
128: option code  
ASCII: data type  
1: granularity  
0: no maximum size of granularity, i.e. infinite
- 3 Create a Client Identifier macro by typing in the following:  
  
Nortel-i2004-A m:NI2004="Nortel...":  
  
Or

- *End of Procedure* -----

## DhcptabTable

## Network Table

P0938045 Standard 1.00 December 2000

0100C04F662B6F 00 47.147.65.199 47.147.74.36 944600959 nbvws286

## Format of ITG Card Information

For the proper format of encoding the ITG card information consult the Functional Specification or see the excerpt below:

### DHCP Support for i2004

DHCP support in the i2004 terminal requires sending a "Class Identifier" option with each DHCP Discovery and Request message. Additionally, the i2004 checks for either a Vendor Specific option message with a specific, unique to Nortel i2004, encapsulated sub-type OR a site specific DHCP option.

In either case, a Nortel i2004 specific option must be returned by the i2004 aware DHCP server in all Offer and ACK messages. The i2004 will use the information returned in this option to configure itself for proper operation. This includes binding a new IP address, netmask and gateway (for local IP stack) as well as configuring Server 1 (minimum) and, optionally Server 2. By default, Server 1 is always assumed to be the "primary" server after a DHCP session.

The i2004 will not accept any Offers/Acks if they do not contain:

- A Router option (i2004 needs a default router to function) AND
- A Subnet Mask option AND
- Either:
  - A Vendor Specific option as specified below OR,
  - A site specific option as specified below.

**Note 1:** The initial DHCP implementation required only the Vendor Specific encapsulated sub-option. In inter-op testing with WinNT (up to SR4), however, it was discovered that WinNT does not properly adhere to RFC 1541. As a result it is not possible to use this option. The implementation was changed to add support for either Vendor Specific sub-ops or Site Specific options. This new extension has been tested and verified to work with WinNT.

**Note 2:** The site-specific options are all DHCP options between 128 (0x80) and 254 (0xFE). These options are reserved for site specific use by the DHCP RFCs.

## **Format for Nortel Networks i2004 Terminal DHCP Class Identifier Field**

All i2004 terminals fill in the Class ID field of the DHCP Discovery and Request messages with:

**"Nortel-i2004-A"**, where:

- ASCII encoded, NULL (0x00) terminated
- unique to Nortel i2004
- "-A" uniquely identifies this version.

## **Format for Nortel Networks i2004 Terminal DHCP Encapsulated Vendor Specific Field**

This sub-option must be encapsulated in a DHCP Vendor Specific Option (Refer to RFC 1541 and RFC 1533) and returned by the DHCP server as part of each DHCP OFFER and ACK message in order for the i2004 to accept these messages as valid.

The i2004 will pull the relevant information out of this option and use it to configure the IP address etc. for the primary and (optionally) secondary TPS's.

**Note 1:** Either this encapsulated sub-option must be present OR a similarly encoded site-specific option must be sent (see below), i.e. configure the DHCP server to send one or the other - not both.

**Note 2:** The choice of using either Vendor Specific or Site Specific options is provided to allow WinNT DHCP servers to be used with the i2004 (WinNT servers do not properly implement the Vendor Specific Option and as a result, WinNT implementations must use the Site Specific version).

### Format of the Encapsulated Vendor Specific Sub-option field

- **Type (1 octet).** 5 choices: 0x80, 0x90, 0x9d, 0xbf, 0xfb (128, 144, 157, 191, 251). Providing a choice of five types allows the i2004 to work in environments where the initial choice may already be in use by a different vendor. Pick only one TYPE byte.
- **Length (1 octet):** variable - depends on message content.
- **Data (length octets):** ASCII based with the following format:

"Nortel-i2004 A,iii.jjj.kkk.lll:ppppp,aaa,rrr;iii.jjj.kkk.lll:pppp,aaa,rrr."

where:

"Nortel-i2004-A" - uniquely identifies this as the Nortel option

"-A" signifies this version of this spec. Future enhancements could use "-B".

ASCII "," is used to separate fields

ASCII ";" is used to separate Primary from Secondary server info

ASCII "." is used to signal end of structure

"iii.jjj.kkk.lll:ppppp" - identifies IP:port for server (ASCII encoded decimal)

"aaa" - identifies Action for server (ASCII encoded decimal, range 0..255)

"rrr" - identifies retry count for server (ASCII encoded decimal, range 0..255). This string may be NULL terminated although the NULL is not required for parsing.

**Note 1:** "aaa" and "rrr" are ASCII encoded decimal numbers with a range of 0..255. They identify the "Action Code" and "Retry Count", respectively, for the associated TPS server. Internally to i2004 they will be stored as 1 octet (0x00..0xFF). Note that these fields must be no more than 3 digits long.

**Note 2:** The first server is always considered "Primary"; second server always considered "Secondary".

**Note 3:** If only one server is required, terminate primary TPS sequence immediately with "." instead of ";"; e.g.

"Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr."

**Note 4:** Valid options are one server or two servers (0, 3... not allowed).

**Note 5:** Action code values:

- 0 - reserved
- 1 - UNISlim Hello (currently only this type is a valid choice)
- 2..254 - reserved
- 255 - reserved

**Note 6:** iii,jjj,kkk,lll are ASCII encoded, decimal numbers representing the IP address of the server. They do not need to be 3 digits long as the. and : delimiters will guarantee parsing. For example, '001', '01' and '1' would all be parsed correctly and interpreted as value 0x01 internal to the i2004. Note that these fields must be no more than 3 digits long each.

**Note 7:** ppppp is the port number in ASCII encoded decimal. It does not need to be 5 digits long as the : and , delimiters will guarantee parsing. For example, '05001', '5001', '1', '00001' etc. would all be parsed correctly and accepted as correct. The valid range is 0..65535 (stored internally in i2004 as hexadecimal in range 0..0xFFFF). Note that this field must be no more than 5 digits long.

**Note 8:** In all cases, the ASCII encoded numbers are treated as decimal values and all leading zeros are ignored. More specifically, a leading zero does not change the interpretation of the value to be OCTAL encoded. For example, 0021, 021 and 21 are all parsed and interpreted as decimal 21.

## **Format for Nortel Networks i2004 Terminal DHCP Site Specific Option**

This option uses the "reserved for site specific use" DHCP options (128 to 254 - Refer to RFC 1541 and RFC 1533) and must be returned by the DHCP server as part of each DHCP OFFER and ACK message for the i2004 to accept these messages as valid.

The i2004 will pull the relevant information out of this option and use it to configure the IP address etc. for the primary and (optionally) secondary TPS's.

**Note 1:** Either this site specific option must be present OR a similarly encoded vendor-specific option must be sent (as described above), i.e. configure the DHCP server to send one or the other - not both.

**Note 2:** The choice of using either Vendor Specific or Site Specific options is provided to allow WinNT DHCP servers to be used with the i2004 (WinNT servers do not properly implement the Vendor Specific Option and as a result, WinNT implementations must use the Site Specific version).

### Format of the DHCP Site Specific field

- **Type (1 octet):** 5 choices 0x80, 0x90, 0x9d, 0xbf, 0xfb (128, 144, 157, 191, 251). Providing a choice of five types allows the i2004 to work in environments where the initial choice may already be in use by a different vendor. Pick only one TYPE byte.
- **Length (1 octet):** variable - depends on message content.
- **Data (length octets).** ASCII based format:

"Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr;iii.jjj.kkk.lll:pppp,aaa,rrr."

where:

"Nortel-i2004-A" - uniquely identifies this as the Nortel option

"-A" signifies this version of this spec. (Future enhancements could use "-B" for example.)

ASCII "," is used to separate fields

ASCII ";" is used to separate Primary from Secondary server info

ASCII "." is used to signal end of structure

"iii.jjj.kkk.lll:ppppp" - identifies IP:port for server (ASCII encoded decimal)

"aaa" - identifies Action for server (ASCII encoded decimal, range 0..255)

"rrr" - identifies retry count for server (ASCII encoded decimal, range 0..255) This string may be NULL terminated although the NULL is not required for parsing.

**Note 1:** "aaa" and "rrr" are ASCII encoded decimal numbers with a range of 0..255. They identify the "Action Code" and "Retry Count", respectively, for the associated TPS server. Internally to i2004 they will be stored as 1 octet (0x00..0xFF). Note that these fields must be no more than 3 digits long.

**Note 2:** First server is always considered "Primary", second server always considered "Secondary".

**Note 3:** If only one server is required, terminate primary TPS sequence immediately with "." instead of ";" e.g.  
"Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr."

**Note 4:** Valid options are one server or two servers (0, 3... not allowed).

**Note 5:** Action code values:

0	- reserved
1	- UNISlim Hello (currently only this type is a valid choice)
2..254	- reserved
255	- reserved

**Note 6:** iii,jjj,kkk,lll are ASCII encoded, decimal numbers representing the IP address of the server. They do not need to be 3 digits long as the. and: delimiters will guarantee parsing. For example, '001', '01' and '1' would all be parsed correctly and interpreted as value 0x01 internal to the i2004. Note that these fields must be no more than 3 digits long each.

**Note 7:** ppppp is the port number in ASCII encoded decimal. It does not need to be 5 digits long as the. and: delimiters will guarantee parsing. For example, '05001', '5001', '1', '00001' etc. would all be parsed correctly and accepted as correct. The valid range is 0..65535 (stored internally in i2004 as hexadecimal in range 0..0xFFFF). Note that this field must be no more than 5 digits long.

**Note 8:** In all cases, the ASCII encoded numbers are treated as decimal values and all leading zeros are ignored. More specifically, a leading zero does not change the interpretation of the value to be OCTAL encoded. For example, 0021, 021 and 21 are all parsed and interpreted as decimal 21.